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New York State Agricultural Experiment Station

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CIDER MAKING ON THE FARM

SELECTING VARIETIES

The most important consideration in making a good cider is the proper selection of the apples from which it is to be made. There is wide variation in flavor and quality of ciders made from different

FIG. 1.—SMALL HAND CAPPER FOR CROWN CAPS.

varieties of apples and even from the same variety when pressed at different stages of maturity.

In this country, where cider is made largely from "dessert" varieties, too little thought is given to proper selection of varieties. In England, France, and Germany where the making of ciders has developed into a fine art, many orchards are planted solely for cider-making purposes. The cider-making quality of each variety has been definitely determined by practical methods, and satisfactory blends worked out for different varieties. Certain varieties have been found to possess outstanding value for cider making, producing the highest quality cider without blending, and are ranked in a class by themselves. In this country we have as yet practically no distinct cider varieties.

The cider-making quality of apples is dependent to a large extent on the chemical composition of the fruit. Based chiefly on their acid and tannin content, apples may be grouped rather loosely into the five classes shown in Table 1.

TABLE 1.—CLASSIFICATION OF VARIETIES FOR CIDER PURPOSES.

1, ACID TO SUB-ACID	2, SUB-ACID TO MILD	3, AROMATIC-SPICY	4, ASTRINGENT	5, NEUTRAL
Rome Beauty	Baldwin	McIntosh	Crab varieties and wild seedling types	Ben Davis
Northwestern Greening	Northern Spy	Delicious		Black Ben
Duchess	Winesap	Golden Delicious		Stark
Yellow Transparent	Rhode Island Greening	Roxbury Russet		Gano
Alexander	Golden Russet	Winter Banana		
Wolf River	Wealthy	White Pearmain		
Red Astrachan	Wagener			
Maiden Blush	Jonathan			
	Hubbardston			
	King			
	Grimes Golden			
	Canada Red			

Good cider can be made from any of the varieties listed in Classes 2 and 3, either pressed straight or blended with one another. A good cider cannot be made from the varieties in Classes 1 or 4 when used alone. Cider made from Class 1 varieties is too sour, while that from Class 4 is too astringent. By adding 3 to 5 per cent of any of the varieties in Class 4 to any of the varieties in Classes 2 and 3 a very good cider of sprightly quality with a clinging after taste is obtained.

The varieties in Class 5 do not make good cider when used alone. They are low in both tannin and acid and lack flavor, but by blending them in amounts as high as 25 per cent with the varieties in Class 1, a pleasingly tart cider of good quality can be made. The varieties in

Class 4 have a high content of tannin and, when used judiciously, give the cider a "tangy" after taste that is highly desirable.

By expressing small lots of the varieties of apples to be used and blending the juices obtained until a desirable flavor is reached, then mixing the varieties in large quantities in the same proportions for pressing, it is possible to use apples of all varieties and to produce a cider of excellent flavor.

USE SOUND, MATURE FRUIT

Sound, ripe apples should be used. Ripe apples contain the maximum amount of sugar, flavor, and aroma. Rotten or partially rotten fruit should not be used. The decayed tissue usually carries harmful bacteria and molds which grow in the cider and cause a distinct lowering of quality and in some cases ruin it for beverage purposes.

If one is able to choose the time at which the fruit is picked, the apples should be left on the tree until they are fully mature. When cull apples are being used, or if it is necessary to harvest the crop before full maturity, the quality of the cider obtained will be improved by ripening the apples before they are pressed. This can be accomplished by placing loose boards over pieces of 2 by 4 inch scantlings in an airy room, and by piling the fruit on this platform to a depth of 2 to 3 feet. Use only sound fruit and always provide a false floor to insure a good circulation of air. Fruit may be stored in this way in cool weather for 2 to 3 weeks. The fruit is ready for pressing when it has developed the flavor and odor characteristic of the variety, but while it is still too firm for eating out of the hand.

Piling "windfalls" and partially decayed fruit in heaps on the ground results in a heavy loss of fruit and in a poor cider with an earthy, foreign flavor. Partially grown windfalls which possess neither aroma nor fruity flavor are worthless for cider making, and a small quantity of their highly acid, astringent juice may ruin a large volume of cider.

WASHING, GRINDING, AND PRESSING THE FRUIT

A 5-minute dip in a diluted acid wash[1] followed by thoro rinsing in running water will remove the bulk of any spray residue that may

[1] The acid wash may be made by adding 6 quarts of concentrated hydrochloric acid to 100 gallons of water. The acid should be poured in a thin stream into the water, stirring vigorously, meanwhile. It should be stored in a wooden container. In dipping the fruit in the acid wash, the hands should be protected by rubber gloves.

be present. It will also remove much of the dirt and most of the organisms that cause spoilage and undesirable flavors.

Care should be taken to grind the fruit sufficiently fine to obtain the maximum yield of juice. Most of the commercial grinders on the market are adequate for the purpose. Grinders of the cylindrical grater type are more efficient than the roller type. If a deep color is desired, let the ground apples stand for a period of 12 to 24 hours before pressing.

The so-called "barrel" press is the least efficient of the hand presses commonly used. The yield is low and it is necessary to place boards around the outside to prevent loss of juice, due to spurting when pressure is applied. The rack and cloth type of press (Fig. 2) is much better, giving a higher yield of juice with less labor. For an

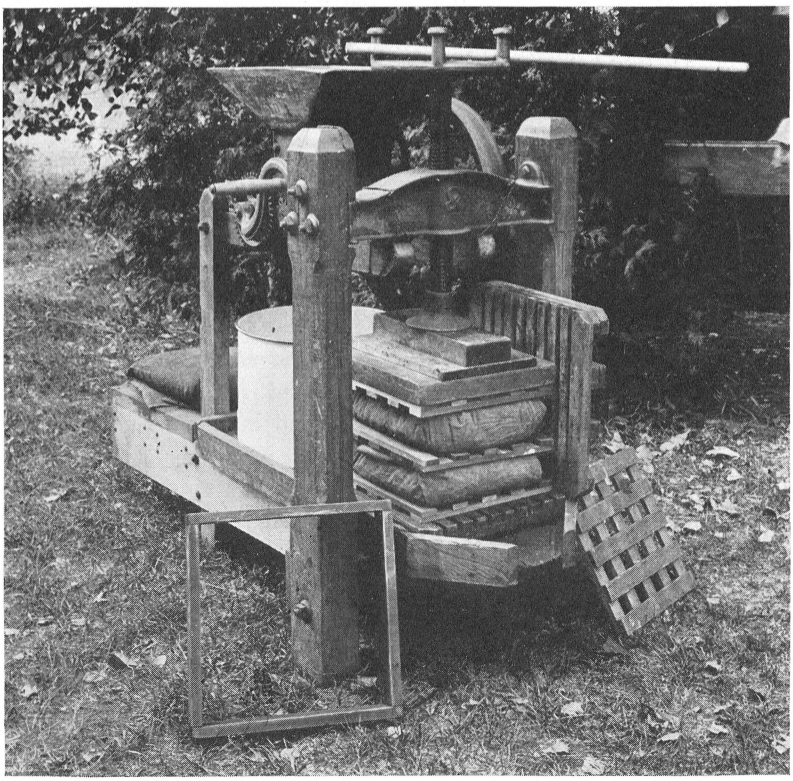

FIG. 2.—HAND PRESS OF THE RACK AND CLOTH TYPE.

ordinary home press of the rack and cloth type, the following equipment is needed: A form, a dozen or more racks, and six press cloths.

A rack is a lattice work composed of laths crossing each other at right angles and nailed together. Laths 1½ inches wide and ¼ to ½ inch thick, set from 1 to 1½ inches apart make a substantial rack. Square racks 14 inches wide are a convenient size. A form is a square box without top or bottom made of boards 5 by 13 inches. Copper or brass nails should be used in making racks and forms. The cloths to fit these racks should be cut in squares 24 inches wide.

To load the press, a rack is laid on the pressure platform and the form placed on the rack and covered with a cloth. The cloth is put on in such a way that it carefully lines the form. The form is then filled up with apple pulp. The cloth is then lapped and folded upon the pulp and the form pulled off. Another rack is put on this cloth full of pulp, and another "cheese" is built on the second rack in the same way as on the first one. Three or four layers are made in this way. The pulp is then pressed by working the screw in the way used to press the pulp in the old type lattice barrel press.

Care should be taken both in grinding and in pressing to have the least possible contact of pulp or juice with iron. Prolonged contact with iron results later in the blackening of the cider when it is exposed to air. Use of brass nails in making racks, baskets, and press is recommended.

Cider readily picks up foreign flavors. Because of this fact burlap cloth or bagging should not be used for press cloths, as it injures the flavor. Press cloths made of cotton duck or drilling are best. Grain, sugar, or flour sacks make satisfactory home-made press cloths if they are boiled in water for several hours and thoroly rinsed. Press cloths should be cut so that they are one and one-half times as long as the sides of the rack with which they are to be used. If the press cloths are thrown into a tub of clean cold water at night, and wrung out in the morning before use, no objectionable flavor will be acquired from the cloth.

Racks made of beech, oak, maple, basswood, or elm are practically tasteless. New racks should be immersed in hot paraffin before use.

All parts of the equipment used in pressing should be kept clean by washing thoroly with cold water and rinsing with scalding water. Press cloths and straining cloths should be cleaned first with cold water, then boiled, and finally rinsed well. When the condition of

the equipment is very bad, a liberal use of any good chlorinated soda preparation followed by thoro rinsing is necessary.

Power presses of the hydraulic type are, of course, more efficient than the hand type and are of greater capacity. With a good hand press, an average yield of from 3 to 3½ gallons may be obtained. Presses of the hydraulic type will give 25 per cent better yield than can be obtained by the use of a hand press.

Cider should never be stored in dirty containers. The best cider made can be spoiled in a few hours by putting it in a bad barrel. If barrels are to be used, they should be washed several times with hot water to remove all soluble material from the wood. They should then be thoroly sterilized with live steam or some tasteless chemical sterilizing agent and finally rinsed with clean cold water. Hot paraffin applied to the inner surface of the barrel after cleaning it thoroly provides an additional safeguard against contamination.

STORAGE

Cider as it comes from the press is well inoculated with yeasts. In 2 weeks' time, at a temperature of 40° to 50°F, an unclarified cider will show a content of more than 1½ per cent alcohol. If it is chilled quickly to the freezing point after pressing and held in cold storage at 32°F, it will keep without noticeable fermentation for 30 to 50 days. If it is to be kept unfermented, the yeasts and other organisms must be removed, killed, or prevented from multiplying. This may be done in a number of ways which will be described later.

CLARIFICATION

Filtration of freshly pressed raw cider is not practical as the filter is quickly clogged by a mucilaginous deposit. To clarify cider, it is necessary to get the finely suspended and colloidal material in a filterable condition and then to remove it by filtration.

Freshly pressed cider may be made readily filterable by the use of certain enzymes, by the addition of gelatin and tannin, or by the flash-heating method described in Technical Bulletin No. 202 of this Station. The enzymic and gelatin-tannin methods require no special mechanical equipment and are recommended for farm work in preference to the flash-heating process which is more suitable for large-scale mill operation.

Correctly carried out, the enzymic and gelatin-tannin methods produce a bright clear cider. The use of gelatin and tannin in

clarification produces a cider that is much lighter in color than normal. Due to removal of much of the tannin and pectin, cider clarified in this way also lacks "body" and full flavor. It carbonates well, however, and when carbonated gradually darkens to a deep amber color. The filtered cider, when preserved as directed, does not cloud or deposit any sediment even on prolonged storage at room temperatures. Enzymic clarification with Pectinol A gives a bright, clear filtrate with but little loss of color and very little loss of flavor.[2] It is necessary in the enzymic process, however, to heat the filtered product at 140°F for 10 minutes to stop action of the enzyme or the clarified product will gradually become cloudy and deposit sediment on standing.

ENZYMIC CLARIFICATION

"Pectinol A" is a commercial enzyme preparation. When added to freshly pressed cider, it breaks down certain of the colloids present and causes precipitation and settling out of the substances that cause cloudiness in the juice. To bring about coagulation of the colloidal material in the cider, a definite amount of the preparation is added directly to the cider to be clarified. The time necessary to get cider in condition to filter will depend upon the amount of "Pectinol A" added, the temperature at which the cider is held, and the varieties and degree of ripeness of the apples from which the cider was made. An increase in the amount of enzyme added speeds up its clarifying action. In order to prevent fermentation it is advisable to work below 60°F and as near 32°F as practical.

For the reasons given it is difficult to fix the amount of enzyme needed. However, if the enzyme is added at the rate of 20 to 30 ounces per 100 gallons of cider and if the mixture is allowed to stand for 12 to 16 hours in a cold place, the cider can be easily filtered. After the enzyme has been added, a quart or more of the cider should be withdrawn and placed in a glass container for observation. When the bulk of the suspended matter has settled to the bottom of the container and when the liquid above it is fairly clear, the cider is ready to be filtered in the manner to be described later.

GELATIN-TANNIN METHOD

When gelatin is added to acid fruit juices it forms a flocculent precipitate caused by a combination of the gelatin with the tannin

[2] Pectinol A may be obtained from The Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.

and the pectin in the juices. As this precipitate forms and settles out, it carries down with it most of the finely suspended particles which make the juice cloudy. In order to have enough tannin present to form a large volume of precipitate, a solution of tannin is first added to the juice to be clarified. Since ciders vary in composition, they must first be tested to determine the amounts of tannin and gelatin needed for clarification. To do this make up two test solutions, as follows:

Solution 1.—Dissolve 1/3 ounce of tannin in 5.95 fluid ounces of 95 per cent alcohol. Then add 23.8 fluid ounces of water and mix thoroly.

Solution 2.—Dissolve 3/4 ounce of gelatin in 23.8 fluid ounces of water and add 5.95 fluid ounces of 95 per cent alcohol. Heat a portion of the water and add the powdered gelatin slowly, stirring continuously. Then add the rest of the water and dissolve the gelatin by heating in a pan of hot water or double boiler and stirring. Add the alcohol and mix well.

These solutions should be kept in separate stoppered glass containers and may be used as needed, the alcohol acting as a preservative in both cases. In some cases the gelatin solution will jell when cold, but it can be liquefied when needed by putting the container in hot water.

Four white glass quart bottles should then be filled up to the neck with cider and numbered 1, 2, 3, and 4. Then add to each bottle the following amounts of solution 1 (tannin) and solution 2 (gelatin):

	Bottle No. 1	Bottle No. 2	Bottle No. 3	Bottle No. 4
Sol. 1, cubic centimeters[3].....	10	10	10	10
Sol. 2, cubic centimeters.....	5	10	15	20

Measure and add the amounts of solutions shown to each bottle, adding the tannin solution first in all cases and shaking well after the addition of each solution. Let the bottles stand 10 minutes and the bottle which shows the most clear juice is the one to which the proper proportions of tannin and gelatin were added.

The quantity of gelatin and tannin to use for 100-gallon batches of cider is then found by referring to Table 2. For smaller amounts

[3] A glass measuring cylinder, graduated in cubic centimeters may be purchased at any well-equipped drug store.

of cider, proportionate amounts of tannin and gelatin are used. For example, if bottle No. 3 showed the greatest amount of clear juice at the end of the 10 minute period, 1.25 ounces of tannin and 4.2 ounces of gelatin should be added to 100 gallons of cider; for 50 gallons, one-half these amounts, or 0.63 ounce of tannin and 2.1 ounces of gelatin should be added to the cider.

TABLE 2.—AMOUNTS OF GELATIN AND TANNIN TO BE USED FOR 100 GALLONS OF CIDER BASED ON DIFFERENT TESTS.

	BOTTLE No. 1	BOTTLE No. 2	BOTTLE No. 3	BOTTLE No. 4
Tannin, ounces.....	1.25	1.25	1.25	1.25
Gelatin, ounces.....	1.50	3.00	4.20	6.00

When the correct amounts of gelatin and tannin have been determined, the proper amount of tannin is dissolved in about 2 quarts of hot water (for a 100-gallon batch) and is then poured into the container of juice in a thin stream, stirring constantly. Ten minutes after the tannin has been put in the juice, the gelatin solution prepared by dissolving powdered gelatin in hot water as described for the test solution is added in like manner, with constant stirring. If the correct amounts of gelatin and tannin have been used, the juice starts to clear at once, and if left undisturbed, will be ready for filtration after standing 16 to 24 hours.

FILTRATION

The outfit[4] necessary for filtration comprises first a mixing and a supply tank (Figs. 3 and 4). A barrel with the head removed may be used for handling small quantities of cider. In any case, it should be made of wood which does not impart a taste to the cider. As it is necessary to have a small pressure head on the filter, a platform may be built to support the supply tank at the proper height or it may be placed on the floor above. The greater the elevation, the more rapid will be the flow from the filter. For use with a small home-made filter the height should not exceed 15 feet. A 6-foot head will give a flow of about 1 gallon per minute. For small-scale work the cider can be carried or hand-pumped to the supply tank. Delivery from

[4] This filter was developed at the Michigan Agricultural Experiment Station and is described in *Michigan Agr. Exp. Sta. Quart. Bul. No. 15, 191–197. 1933.*

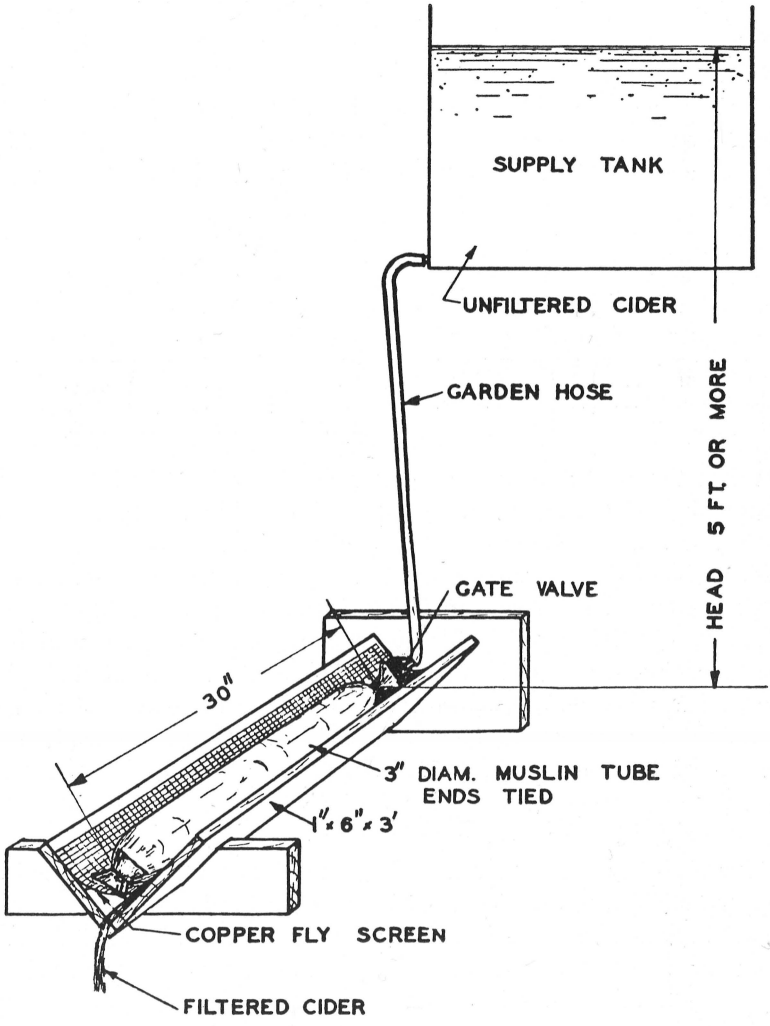

FIG 3.—DIAGRAM OF HOMEMADE FILTER.

tank to filter is made thru a rubber garden hose, preferably of 5/8-inch diameter. The tank may be bored and fitted with a brass spigot or the cider may be siphoned from the barrel. There should be a cut-off at the end of this delivery hose. A gate valve fitted with two nipples is a very good arrangement. One 3/8-inch nipple with bushing will fit the end of the hose and the filter tube can be attached to

FIG. 4.—THE HOMEMADE FILTER USED AT THE STATION.

the other nipple. This provides a workable arrangement for shutting off the flow when it is necessary to clean the filter tube, or to start the siphon.

The filtering tube is a long slender cloth tube closed at one end and with the other end connected to the delivery hose. This tube is made of unbleached muslin, about a yard long, and is sewed to give a diameter of not over 3 inches. Both ends of the tube should be left open to make cleaning easier. In use, the dead end is folded back, carefully gathered, and securely tied. The other end is wrapped tightly around the nipple at the end of the delivery hose and securely tied. The tube, supported by a copper window screen, is then placed in a slightly inclined position in a wood trough.

The cider, previously treated as described with Pectinol A or with tannin and gelatin, is placed in the mixing tank. Hy-flo Super-cel[5] is added to the cider at the rate of 2 to 6 pounds per 100 gallons. This mixture of Hy-flo Super-cel and cider should be thoroly stirred with a wooden hand paddle. During filtration it should also be stirred frequently.

When this mixture of cider is fed into the closed cloth tube the cider is forced out rather uniformly over the surface of the tube and the filter aid forms a cake of uniform thickness on the inside. The trough is given a slight slope and the clear juice runs out of one end into the container. The first 2 or 3 gallons run thru while building up a filter cake in the tube will not be clear and should be returned to the supply tank and refiltered. In use, the filter gradually becomes clogged by the material removed from the cider and the rate of flow drops. When desired, the flow may be stopped at the gate valve and the tube removed and cleaned. To do this untie the tube and shake and rinse it thoroly. If running water is available, the tube can be held over the end of the faucet and flushed out.

Cider clarified and filtered in this way may be marketed at once if it is to be consumed within a few days. However it still contains sufficient yeast to cause fermentation and subsequent clouding of the cider and must be preserved by pasteurization or by other means if it is to be kept unfermented.

[5] Hy-flo Super-cel is a treated infusorial earth. When it is thoroly mixed with the cider and forced thru the cloth under pressure, it builds up a porous filter cake. As the cider passes thru this porous filter cake, the materials causing cloudiness are collected by the cake and a clear juice results. Hy-flo Super-cel may be obtained from Johns-Mansville Corp., Buffalo, N. Y., or from local distributors.

A SIMPLE METHOD OF CARBONATING CIDER

Carbonated clarified sweet cider is a beverage which appeals to the majority of people who have tried it. The increased sharpness and tingle imparted to the cider by the addition of carbonic acid gas gives added zest and is especially pleasing in very sweet ciders high in sugar and low in acid content. When this beverage is better known and generally available, it should become very popular and compete successfully with ginger ale and other carbonated beverages of high quality.

Commercially, beverages are carbonated by machines which charge the beverage with gas at the desired pressure and bottle and seal it in one continuous operation. This equipment is rather expensive and not ordinarily available on the farm. However, it is possible to carbonate cider and other beverages by a simple procedure which does not necessitate the purchase of any costly equipment. This novel method simply requires the addition of a weighted quantity of solid carbon dioxide, or "dry ice," to the cold clarified juice, capping, and sealing immediately with crown cork caps, followed by shaking to absorb the carbonic acid gas in the cider.[6] Carbonation should be restricted to the smaller sized bottles, containers of a half pint to 1 quart capacity being most suitable.

The quantity of carbon dioxide that cider will absorb increases rapidly as the temperature of the cider decreases. Carbonation is therefore best carried out on very cold cider. Cider to be carbonated should be 40°F or lower if possible and never higher than 45°F. When means of cooling the juice to this temperature are available, carbonating may be done at any time convenient. The containers must be of the so-called soda-water type with the neck of the bottle designed for use with the crown cork seal and made to withstand pressure. The bottles should be thoroly cleaned and sterilized before using with scalding water, steam, or by the use of a sodium hypochlorite solution.

Do not fill the bottles completely. A head space is necessary to take care of the gas pressure that develops in the bottle when the temperature is increased. Seven ounces of clarified cider in an 8-ounce bottle and proportionate amounts in the pint and quart sizes allow ample head space to take care of pressures developed by the necessary pasteurizing temperatures.

[6] Dry ice may be obtained from the American Dry Ice Co., New York City, or their local distributors.

When the bottles are filled with the proper amount of cold cider, the correct amount of dry ice is chipped off, accurately weighed[7] on a tared paper, and quickly transferred to the bottle. The bottle is sealed at once with the crown cork cap. The bottle is then wrapped loosely with a heavy cloth and shaken intermittently until the carbon dioxide is all absorbed. (The bottle is wrapped in the cloth in order to prevent injury in case a cracked or defective bottle should burst.) During the transition of solid carbon dioxide to the gaseous state and while it is being absorbed in the cider, a high pressure is developed in the bottle. Absorption of the gas and lessening of this pressure takes place relatively slowly if the cider is above 45°F with possible danger of bursting the container. In carbonating by this method it is well to emphasize the following points:

1. The temperature of the cider to be carbonated should never be above 45°F, and should be as near to 32°F as possible.
2. The dry ice should be weighed accurately and carbonation should never exceed 4 volumes of CO_2.
3. When the dry ice has been added to the cider and the bottle has been sealed, the bottle should always be wrapped with a heavy piece of cloth and shaken vigorously to dissolve the carbon dioxide in the cider.
4. If the dry ice is touched with the hands, gloves should be worn to prevent possibility of "frostbite."

The weight of dry ice and approximate volume of carbonation to correspond are shown in Table 3.

TABLE 3.—AMOUNT OF DRY ICE REQUIRED FOR DIFFERENT VOLUMES OF CARBONATION.

WEIGHT OF DRY ICE, GRAMS	VOLUME OF JUICE, FLUID OUNCES	VOLUME OF CONTAINER, FLUID OUNCES	VOLUME OF CARBONATION
1.0	7	8	1.8
1.5	7	8	2.8
2.0	7	8	3.9

Proportionate amounts of dry ice and cider are used for the pint and quart bottles. A carbonation of 2 volumes suits the average taste, while higher carbonation masks the natural delicate cider flavor.

Carbonating cider helps to keep it sweet, but unless the cider has been previously preserved by chemical means, it will be necessary to

[7] A triple-beam balance suitable for this work may be obtained from the W. M. Welch Scientific Company, Chicago, Ill.

pasteurize it if it is to be kept unfermented. Specific directions for pasteurizing carbonated cider are given on page 18.

PRESERVATION OF CIDER

Cider, even when made under sanitary conditions, is well inoculated with organisms. Yeast is normally present on the skin of apples. Yeasts, molds, and bacteria are present in the air and in decayed spots, dirty fruit, and unclean containers. These organisms increase rapidly, unless means are taken to prevent their growth or to remove them entirely.

Cider may be preserved in several ways. Filtration thru the Seitz germ-proofing filter[8] is an effective means of removing organisms present, but the initial cost of this equipment and the necessity for close control in operation precludes its use for work on a small scale.

PRESERVING BY FREEZING

Where cold storage is available, freezing and storage at low temperatures (10°F or lower) is an excellent method of preserving cider. Cider, in closed containers, frozen at 10°F or lower and stored continuously at the same low temperature may be kept a year or more with practically no injury to its normal delicate flavor or aroma.

Cider may be frozen and stored at 10°F or lower in glass bottles and glass carboys without breakage if the containers are filled to not more than 4/5 of their capacity. It may be frozen equally as well in paper cups, wooden kegs, and wooden barrels if the same allowance is made for expansion of the cider when frozen.

Freezing and storage at 10°F or lower is particularly valuable in preserving the full natural flavor of unclarified cider. In marked contrast to other methods of preserving unclarified cider, the cider preserved by freezing storage shows little change in its physical appearance and no injury to its flavor or aroma. In some ciders preserved by freezing, a very slight amount of jell, which does not dissolve when the cider is thawed, will be found; but the amount so formed is so small that it does not injure the quality or appearance of the thawed cider. Preserving cider by this method assures a year round supply of full flavored, unfermented cider to owners of roadside stands, soft drink dispensers, etc. It must be emphasized, however, that the thawed cider is perishable and will ferment practically

[8] Carpenter, D. C., Pederson, C. S., and Walsh, W. F. Sterilization of fruit juices by filtration, 1. *Ind. and Eng. Chem.*, **24**, *1218–1223. 1932.*

as quickly as a freshly pressed cider. Consequently only as much cider should be withdrawn from storage as is expected to be consumed in the following 2 or 3 days.

Cider frozen in large containers thaws slowly and should be withdrawn from storage 24 hours before it is to be used or offered for sale. Shaking or rolling the container will hasten thawing. Bottles and sealed paraffined cups of frozen cider may be quickly thawed by immersing them in water, shaking the container occasionally.

While cider and other fruit juices can be preserved by the use of chemicals, when used in the amounts necessary to prevent fermentation they give the cider a more or less disagreeable taste. Benzoate of soda in not more than 0.1 per cent quantity (6.5 ounces to 50 gallons of cider) is the only chemical preservative that can be used if the cider is to be offered for sale in New York State. If the preservative is added as soon as the juice is pressed and the product stored in a cool place, cider may be kept in this way for a considerable length of time without noticeable fermentation. However, when the cider preserved with sodium benzoate is intended for sale in New York State, it should be noted that New York State laws permit the use of benzoate of soda in amount not to exceed 0.1 per cent and a statement of the amount of benzoate of soda present must be shown on the container. Other states may have special laws covering the use of this preservative and when cider is offered for sale in a state other than New York, the regulations governing the sale of cider in the state in which it is to be sold should be consulted. While this amount of sodium benzoate may check the growth of yeast and bacteria, it does not prevent the growth of molds. Molds, however, do not grow in the absence of air, therefore, if the container is filled so that no air space remains, there will be no mold growth. Mold growth may also be prevented by floating on the surface of the cider a thin layer (⅛ inch thick) of a tasteless cottonseed or colorless mineral oil.

For use on the farm, the most practical method of preserving cider is pasteurization. In pasteurizing, cider is heated to a temperature high enough to destroy all the organisms present. If too high a temperature is used, the cider acquires a "cooked" taste; but by careful heating at lower temperatures, the taste is very little altered.

PRESERVING BY PASTEURIZING

Pasteurization on a large scale is effected usually by heating the cider to a high temperature for a short time. This process, some-

times called "flash pasteurization," is usually a continuous process, the cider being pumped thru heated coils and run directly into sterile containers and sealed at once.

When small quantities of cider are to be preserved, the "holding" process, *viz.*, heating at a low temperature for 20 minutes or longer is advisable.

Clean bottles of the usual soft drink type or half pint, pint, or quart fruit jars are nearly filled with the clarified cider, allowing a small head space for expansion while heating. If soda-water bottles are used, a hand capping device (Fig. 1) and crown tops may be used for seal-

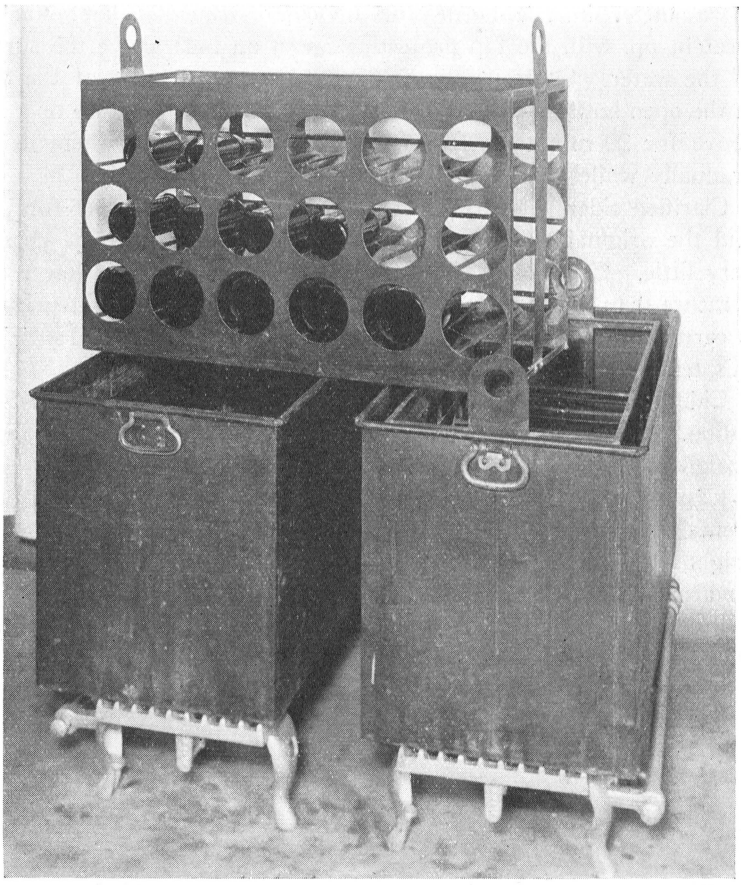

FIG. 5.—PASTEURIZING TANKS AND RACK FOR CARRYING BOTTLES.

ing. New crowns should always be used and the crowns should always be stored in a closed container in a cool dry place. An improperly capped bottle will always spoil. If fruit jars are used, the covers are clamped tightly using new rubber jar rings. The bottles are then placed in a large kettle, wash boiler, or other container of hot water. The container should have a false bottom made of heavy mesh wire, or a tray of screen wire and wooden slats (Fig. 5). This device insures a better circulation of hot water and prevents cracking of the bottles due to direct contact with the heat. When the temperature of the water reaches 180°F, place the bottles in it on their sides so that they are completely covered. Place a thermometer in one bottle full of cider, which is kept standing straight up, with the top projecting about an inch above the surface of the water. Continue the heat until the temperature of the cider in the open bottle reaches 170°F. Hold at this temperature or a little above for 20 minutes. Remove the bottles and allow them to cool gradually while placed on their sides.

Clarified cider pasteurized in this way will remain sweet for years and the original taste and appearance of the cider will be changed very little. Carbonated cider should be pasteurized at a lower temperature than that directed for the clarified still cider. Pasteurization is carried out as described above but at a temperature of 150°F and this temperature is maintained for 30 minutes.

Cider should always be clarified if it is to be preserved by pasteurization. When unclarified cider is pasteurized, it deposits a heavy unsightly sediment and develops a pronounced cooked taste.

Exposure to light and storage in a warm place both have a detrimental effect on the keeping quality of cider. Continued exposure to bright light causes a bleaching or loss of color. Cider when stored in a warm place often becomes hazy or cloudy and deposits an unsightly sediment. Cider should always be stored in a cool place and protected from strong light.

August 1, 1934 W. F. WALSH